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KIMBALL (L ROBERT) AND ASSOCIATES EBENSBURG PA  
NATIONAL DAM INSPECTION PROGRAM. Y.M.C.A. DAM (NDS-ID NUMBER PA--ETC(U)  
JUL 80  
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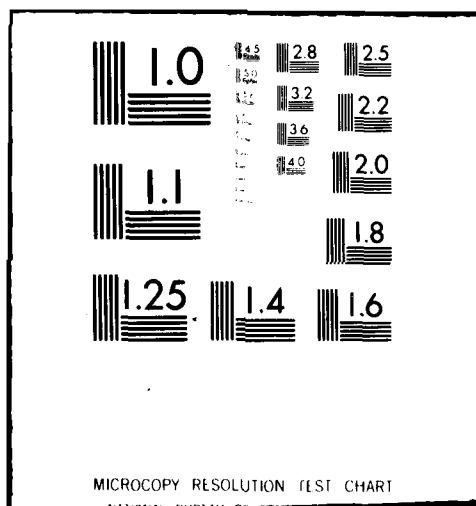
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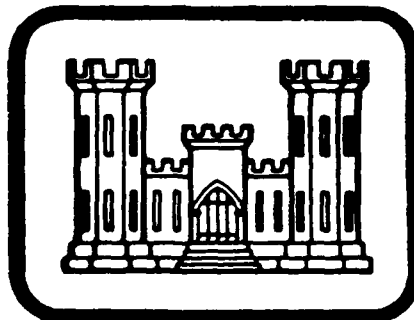
PENNSYLVANIA.

*⑥ National Dam Inspection Program*  
**Y.M.C.A. DAM**

(NDS-ID-10-PA-873,  
DER-ID-10-13-100)

PLEASANT VALLEY WEST PROPERTY OWNERS ASSOCIATION.

PHASE I INSPECTION REPORT  
NATIONAL DAM INSPECTION PROGRAM



*⑪ Jul 80  
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Prepared By

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CONSULTING ENGINEERS & ARCHITECTS  
EBENSBURG, PENNSYLVANIA  
15931

**DTIC  
SELECTED  
SEP 8 1980**

FOR  
DEPARTMENT OF THE ARMY  
BALTIMORE DISTRICT CORPS OF ENGINEERS  
BALTIMORE, MARYLAND  
21203

JULY, 1980

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## PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through frequent inspections can unsafe conditions be detected and only through continued care and maintenance can these conditions be prevented or corrected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the spillway design flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. The spillway design flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

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PHASE I REPORT  
NATIONAL DAM INSPECTION REPORT

NAME OF DAM	YMCA Dam
STATE LOCATED	Pennsylvania
COUNTY LOCATED	Carbon
STREAM	Drakes Creek
DATE OF INSPECTION	April 8, 1980

ASSESSMENT

The assessment of YMCA Dam is based upon visual observations made at the time of inspection, review of available records and data, hydraulic and hydrologic computations and past operational performance. The inspection and review of data of the YMCA Dam did not reveal any problems which require emergency action. The dam appears to be in fair condition. The seepage which was noted along the toe of dam should be monitored and evaluated by a professional engineer knowledgeable in earth dams. The evaluation should be implemented immediately.

YMCA Dam is a significant hazard-intermediate size dam. The spillway design flood (SDF) for a dam of this size and classification is the 1/2 PMF to PMF. Based on the existing potential for loss of life and property damage, the spillway design flood has been selected as the 1/2 PMF (probable maximum flood). The spillway and reservoir are capable of controlling approximately 81% of the PMF. Based on criteria established by the Corps of Engineers, the spillway is termed adequate.

The following recommendations and remedial measures should be instituted immediately.

1. The fence which spans the spillway crest should be removed. The purpose of the fence is unclear. Restricting spillway discharges is a safety hazard and some alternate solution should be developed to serve whatever purpose the fence fulfilled.
2. The seepage and wet areas located on the downstream slope and at the toe of the embankment should be monitored for turbidity and quantity at regular intervals and during periods of heavy precipitation. The seepage observed at the right abutment and along the toe of the downstream slope near the right abutment should be channeled into a collection drainage channel. The discharge from the spring located at the right abutment should be diverted away from the toe of the dam in order that

YMCA DAM  
PA 873

any seepage from the dam along the toe could be observed. The monitoring program and the monitoring readings should be evaluated by a registered professional engineer experienced in dam design and construction. Measures to control seepage should be implemented as required.

3. Provide erosion protection on the downstream slope adjacent to the right spillway wingwall. Erosion protection should be provided on the upstream slope adjacent to the spillway approach wingwalls.

4. Some means of positive upstream closure of the drainline should be developed.

5. Deterioration of the grouted riprap section should be evaluated by a registered professional engineer knowledgeable in dam design and construction and should be repaired as deemed necessary by the investigation.

6. The reservoir drain should be operated and lubricated on a regular basis.

7. A warning system should be developed to warn any downstream residents or property owners of large spillway discharges or imminent failure of the dam. This should be accomplished prior to future development below the dam.

8. A safety program should be implemented with inspections at regular intervals by qualified personnel.



L. ROBERT KIMBALL & ASSOCIATES  
CONSULTING ENGINEERS AND ARCHITECTS

Date

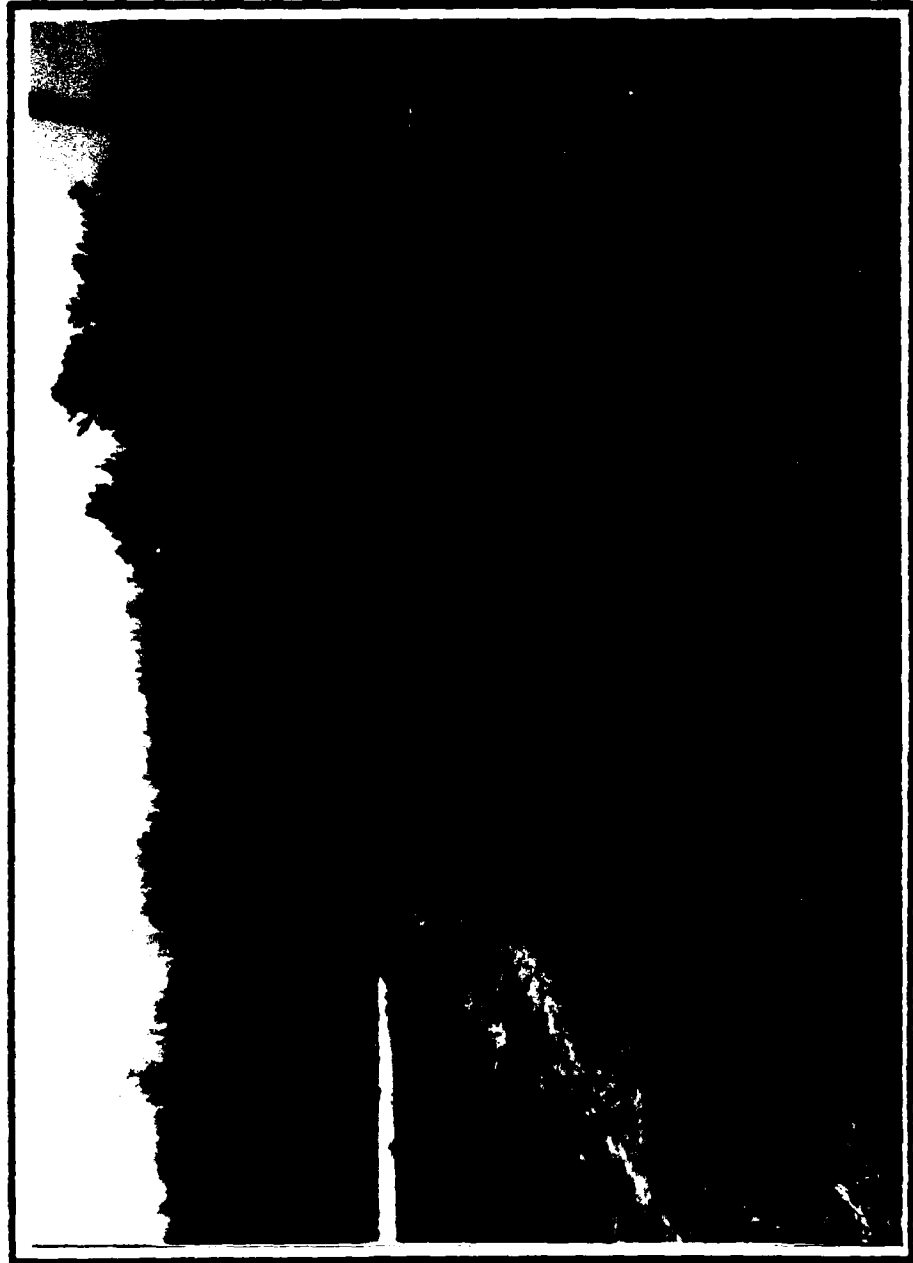
*R. Jeffrey Kimball*  
R. Jeffrey Kimball, P.E.

APPROVED BY:

Date

*15 August 80*

*James W. Peck*  
JAMES W. PECK  
Colonel, Corps of Engineers  
District Engineer



Overview of Y.M.C.A. Dam



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PHASE I  
NATIONAL DAM INSPECTION PROGRAM  
YMCA DAM  
NDI. I.D. NO. PA 873  
DER I.D. NO. 13-100

SECTION 1  
PROJECT INFORMATION

1.1 General.

a. Authority. The National Dam Inspection Act, Public Law 92-367, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a program of inspection of dams throughout the United States.

b. Purpose. The purpose of the inspection is to determine if the dam constitutes a hazard to human life or property.

1.2 Description of Project.

a. Dam and Appurtenances. YMCA Dam is an earthfill dam, 42 feet high and 608 feet long. The crest width is 9 feet. The upstream slope is 2.5H:1V and grass covered. The downstream slope was measured to be 2H:1V and grass covered.

The reservoir drain consists of a 24 inch corrugated metal pipe with a concrete endwall located 270 feet from the left abutment. The spillway consists of a 42 foot long ogee section, 150 feet from the left abutment. The spillway is blocked by a chain linked fence. Reinforced concrete retaining walls are provided along both sides of the spillway channel. The floor of the channel is a reinforced concrete slab for a distance of approximately 60 feet. The exit channel is trapezoidal for its remaining distance to the streambed. The channel is protected with grouted riprap (36 inches thick) for the initial 90 feet. The remaining portion of the exit channel (550 feet in length) to the original streambed is protected with 18 inch thick dumped riprap. Reinforced concrete cutoff walls were extended into the embankment on both sides of the spillway. Gravel drains exist behind the channel walls and also under the channel slab.

The embankment is a zoned earthfill. An impervious clay material was used as the core section along the embankment centerline. A cutoff trench is provided to a depth of 10 feet. The bottom width of the trench is 8 feet. The upstream zone consists of sandy clay material found in borrow areas near the site. The downstream zone is a random fill.

b. Location. The dam is located on Drakes Creek, Carbon County, Pennsylvania. YMCA Dam can be located on the Christmans, U.S.G.S. 7.5 minute quadrangle.

c. Size Classification. YMCA Dam is an intermediate size structure (42 feet high, 280 ac-ft.).

d. Hazard Classification. The hazard classification for YMCA Dam has been determined to be significant. Downstream conditions at the time of the inspection did not indicate that loss of more than a few lives is probable should the structure fail. Future development downstream of the dam is probable and it is evident that plans are in progress to sell lots immediately below the dam.

e. Ownership. YMCA Dam is owned by the Pleasant Valley West Property Owner's Association. Correspondence should be addressed to:

Pleasant Valley West Property Owner's Association  
Christmans, Pennsylvania  
(717) 325-4695

f. Purpose of Dam. YMCA Dam is used for recreation.

g. Design and Construction History. Construction of the YMCA dam was completed in late 1967. Very little information is available on the actual construction of the dam. According to information located in the Pennsylvania DER files the dam was constructed by the Operating Engineers Local under a federally financed manpower retaining program for the Greater Philadelphia YMCA Council. The construction superintendent was Mr. Thomas Barrett. The design engineer was Mr. Theodore K. Rothermund of Penn-Jersey Engineering Company, Portland, Pennsylvania. There is some mention in the Pennsylvania DER files relative to field density testing being made at the site under the direction of the Penn-Jersey Engineering Company. Compression tests of the concrete used in the spillway structure was performed by Allentown Testing Laboratories Inc., Bethlehem, Pennsylvania.

h. Normal Operating Procedures. The owner of the dam did not accompany the inspection team on the inspection of the dam. Neither the owner nor a representative of the owner was available for interview for the purposes of this inspection. It appears that no operations are conducted at the dam. The reservoir drainline appeared to be partially opened and an estimated 100 gpm was discharging from the 24 inch diameter CMP.

### 1.3 Pertinent Data.

#### a. Drainage Area.

1.49 square miles  
(U.S.G.S. 7.5 minute quadrangle)

#### b. Discharge at Dam Site (cfs).

Maximum known flood at dam site	Unknown
Drainline capacity at normal pool	Unknown
Spillway capacity at top of dam	1075
Additional spillway capacity at left abutment	986
Combined discharge capacity	2061

#### c. Elevation (U.S.G.S. Datum) (feet). - Based on assumed principal spillway crest elevation 1535.0. Estimated from U.S.G.S. 7.5 minute quadrangle.

Top of dam - considered low point	1539.0
Top of dam - design height	Unknown
Maximum pool - design surcharge	Unknown
Normal pool	1535.0
Spillway crest	1535.0
Additional spillway capacity (left abutment) crest	1535.6
Upstream invert - 24" drainline	Unknown
Downstream invert - 24" drainline	1499.3
Maximum tailwater	None
Toe of dam	1497.4

#### d. Reservoir (feet).

Length of maximum pool	2200 feet
Length of normal pool	1800 feet

#### e. Storage (acre-feet).

Normal pool	215
Top of dam	280

#### f. Reservoir Surface (acres).

Top of dam	28
Normal pool	19
Spillway crest	19

#### g. Dam.

Type	Earthfill
Length	608 feet
Height	42 feet
Top width	2 feet
Side slopes - upstream	2.5H:1V
- downstream	2H:1V

Zoning  
Impervious core  
Cutoff  
Grout curtain

Yes  
Center section  
Clay core  
Unknown

h. Reservoir Drain.

Type  
Length  
Closure  
Access  
Regulating facilities

24" Corrugated metal pipe  
Unknown  
24" gate valve  
Man-hole on embankment crest  
24" gate valve

i. Spillway.

Type  
Length  
Crest elevation (estimate)  
Upstream channel  
Downstream channel

Concrete ogee  
42 feet  
1535.0  
Lake  
Reinforced concrete  
slab for a distance  
of approximately 60'

## SECTION 2 ENGINEERING DATA

2.1 Design. Review of information in the files of the Commonwealth of Pennsylvania, Department of Environmental Resources revealed that some correspondence and permit information were available for review. No construction plans or structural details were available for review. Information in the Pennsylvania DER files point to the fact that core borings were made but this information was not available in the file nor could it be obtained from the owner.

2.2 Construction. Very little information is available on construction of the dam. At least one inspection report prepared by PennDER in 1967 questions the construction procedures utilized. The report makes mention of large size material (rocks) being incorporated into the embankment fill. Several test result reports relative to the compressive strength of the concrete utilized in construction of the spillway and field density tests of the embankment material are available in the Pennsylvania DER files.

2.3 Operation. No operating records are known to exist.

### 2.4 Evaluation.

a. Availability. Engineering data were provided by Pennsylvania DER, Bureau of Dams and Waterway Management. The owner was not available for interview in regard to operation and maintenance of the dam.

b. Adequacy. No design data was available for review for the purposes of this report. Minimal information was available for review concerning the construction of the dam. The Phase I Report is based on visual inspection and hydrologic and hydraulic analyses. Sufficient information exists to complete a Phase I Report.

SECTION 3  
VISUAL INSPECTION

3.1 Findings.

a. General. The onsite inspection of YMCA Dam was conducted by personnel of L. Robert Kimball and Associates on April 8, 1980. The inspection consisted of:

1. Visual inspection of the retaining structure, abutments and toe.
2. Examination of the spillway facilities, exposed portion of any outlet works and other appurtenant works.
3. Observations affecting the runoff potential of the drainage basin.
4. Evaluation of the downstream area hazard potential.

b. Dam. The dam appears to be in fair condition. From a brief survey conducted during the inspection, it was noted that the main embankment crest to the right of the spillway is generally even. The embankment crest to the left of the spillway in the area of the left abutment was lower in elevation. The crest of the dam as well as the upstream and downstream slopes were grass covered. The crest width was measured to be 9 feet. The upstream slope was measured to be 2.5H:1V and the downstream slope was 2H:1V. Erosion was noted on the downstream slope adjacent to the right spillway wingwall. The potential for erosion exists along the upstream slopes adjacent to both spillway wingwalls.

Seepage was observed in several areas along the downstream toe of the dam and in the area of the drainline discharge structure at the toe of the dam. Flow along the right abutment appeared to be originating from a spring located at the right above the dam. Flow along the toe from this area was measured to be approximately 43 to 45 gallons per minute (See page A-12). Another seepage measurement point was made in the area to the left of the drainline discharge structure. Flow in this area was measured to be approximately 2 gallons per minute. Information obtained in past Pennsylvania DER inspection report memos indicate that seepage was observed during construction of the dam. The location of this seepage was not pinpointed and therefore no determination as to a history of seepage can be made. Comments in the inspection report memo's made during 1967 and 1968 indicate that seepage was evident and only one report mentions the location of the seepage. A 1968 memo indicates that flow was coming from one of the weep holes in the retaining wall on the abutment of the spillway structure. The water was



noted as being clear with no fines and it appears that in the judgement of the inspector that the source of the flow was from groundwater.

c. Appurtenant Structures. The water level at the time of inspection was estimated to be at elevation 1535.0. The spillway appeared to be in good condition and there was no evidence of deterioration of the concrete. The spillway discharge channel immediately below the spillway structure consisted of slush grouted riprap. The discharge channel appeared to be in good condition, although some flow was noted to be discharging from underneath the grouted riprap section. This condition, if allowed to continue could lead to the possible deterioration of portions of the grouted riprap section. A chain link fence which spans the spillway tends to reduce the discharge potential of the spillway.

The drainline for the reservoir consists of a 24 inch corrugated metal pipe. A concrete structure is present at the discharge end of the pipe. The reservoir drain discharge channel eventually joins the natural stream below the dam. Some discharge from the pipe was noted during the inspection and the discharge was estimated to be approximately 100 gpm. A manhole exists on the embankment crest which serves as an entrance to the drainline controls.

A depressed area to the left of the spillway located at the left abutment was observed during the inspection and it was concluded by the inspecting engineers that the area had the potential to provide additional spillway capacity for the dam. It was determined that discharges from this area would flow along a roadway which provides access to the dam.

d. Reservoir Area. The watershed is covered mostly with timberland. The reservoir slopes are gentle to moderate and do not appear to be susceptible to massive landslides which would affect the storage volume of the reservoir or cause overtopping of the dam by displacing water.

e. Downstream Channel. The downstream channel of the YMCA Dam (Drakes Creek) eventually joins the Lehigh River approximately 2 miles downstream. Drakes Creek is relatively narrow for its entire length to the Lehigh River.

3.2 Evaluation. In general, the embankment, spillway structure and outlet works appear to be in fair condition.

SECTION 4  
OPERATIONAL PROCEDURES

4.1 Procedures. Water level is maintained at the spillway crest at elevation 1535.0. The owner of the dam was not available for an interview, therefore the operational procedures for this dam are unknown.

4.2 Maintenance of the Dam. No planned maintenance schedule for the dam is known to exist.

4.3 Maintenance of Operating Facilities. The operating procedures for this dam are unknown. The condition of the facilities is considered fair.

4.4 Warning System in Effect. There is no known warning system in effect to warn any downstream residents or property owners of large spillway discharges or imminent failure of the dam. At the time of inspection there were no downstream residents although it is obvious that plans are to develop the downstream area below the dam.

4.5 Evaluation. The condition of the operating facilities is unknown. There is no known warning system in effect to warn downstream residents.

SECTION 5  
HYDRAULICS AND HYDROLOGY

5.1 Evaluation of Features.

a. Design Data. The Pennsylvania DER files contained only a mention of the hydrologic and hydraulic design considerations used in the design of these facilities. The SCS method was mentioned as being used to determine the hydraulic and hydrologic characteristics of the dam and watershed. Information in the file suggests that a designed span width of 45 feet was considered for the spillway crest as well as 5 feet of freeboard.

b. Experience Data. No rainfall, runoff or reservoir level data were available. The spillway reportedly has functioned adequately in the past.

c. Visual Observations. The spillway appeared to be in good condition. A depressed area was observed at left abutment and this area was considered as being capable of providing additional spillway capacity for the dam. Flow across the left abutment would discharge along the roadway which provides access to the dam and would ultimately discharge flow beyond the toe of dam.

d. Overtopping Potential. Overtopping potential was investigated through the development of the probable maximum flood (PMF) for the watershed and the subsequent routing of the PMF and fractions of the PMF through the reservoir and spillway.

The Corps of Engineers, Baltimore District, has directed that the HEC-1 Dam Safety Version systemized computer program be utilized. The program was prepared by the Hydrologic Engineering Center (HEC), U.S. Army Corps of Engineers, Davis, California, July, 1978. The major methodologies or key input data for this program are discussed briefly in Appendix D.

5.2 Evaluation Assumptions. To enable us to complete the hydraulic and hydrologic analysis for this structure, it was necessary to make the following assumptions.

1. Pool elevation prior to the storm was at the spillway crest elevation 1535.0.

2. Additional discharge capacity exists at the left abutment and flow through this area was considered safe to an elevation of 1539.0 feet. Discharges above an elevation of 1539.0 feet were considered as sufficient to cause erosion at the left spillway wingwall and therefore provide potential for failure of the structure due to overtopping.

3. The top of dam was considered to be at elevation 1539.0 feet.

4. The fence which spans the spillway crest was considered as sufficient to reduce the normal coefficient of discharge of the structure to a value of 3.2. However, no consideration was made of the reduced cross sectional area due to the fence.

5.3 Summary of Overtopping Analysis. Complete summary sheets for the computer output are presented in Appendix D.

Peak inflow (PMF)	2684 cfs
Spillway capacity	1075 cfs
Additional spillway capacity (left abutment)	986 cfs
Combined discharge capacity	2061 cfs

a. Spillway Adequacy Rating. The Spillway Design Flood (SDF) for this dam is the 1/2 PMF to PMF storm. The SDF is based on the hazard and size classification of the dam. Based on the hazard potential for this dam the spillway design flood (SDF) was selected as the 1/2 PMF. Based on the following definition provided by the Corps of Engineers, the spillway is rated as adequate as a result of our hydrologic analysis.

Adequate - All significant hazard dams which pass the spillway design flood (1/2 PMF).

The spillway and reservoir are capable of controlling the 1/2 PMF storm without overtopping the dam. However, the additional spillway capacity at the left abutment provides approximately 48% of the discharge potential for the dam.

The fence in the spillway will reduce the actual spillway capacity determined from this analysis.

5.4 Summary of Dam Breach Analysis. As the subject dam can satisfactorily pass the 1/2 PMF without failure (based on analysis) it was not necessary to perform the dam breach analysis and downstream routing of the flood wave.

SECTION 6  
STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability.

a. Visual Observations. Minor erosion on the downstream embankment slope adjacent to the right wingwall was observed during the inspection. The potential for erosion exists on the upstream embankment adjacent to both wingwalls which provide the approach to the spillway. Discharge from the spillway shows a potential for erosion of the grouted riprap section which provides the outlet channel for spillway discharges. Flow under the grouted riprap could lead to potential deterioration of the discharge channel and the effectiveness of grouted riprap. Two flow areas were noted during the inspection. One flow area was observed to exist along the toe and originating from a spring on the right abutment and flowing along the right abutment embankment contact. It was not possible during the inspection to determine whether the seepage along the toe from the right abutment contact was seepage through the dam or discharge originating from a spring located at the right abutment. Past information available in the Pennsylvania DER files suggest that seepage was noted during construction of the dam. No signs of instability were noted during the inspection. However, long term stability is questionable due to observed seepage noted during the inspection. A second area was noted beyond the toe of the dam adjacent to the drainline discharge structure.

b. Design and Construction Data. Minimal design and construction data exists in the Pennsylvania DER files. Stability analyses, although recommended by DER to the owner of the dam prior to and during construction, were not completed. No stability analyses were conducted for this dam.

c. Operating Records. No operating records are known to exist.

d. Post Construction Changes. No post construction changes are known to have occurred since the structure was built in 1968.

e. Seismic Stability. The dam is located in seismic zone 1. No seismic stability analyses has been performed. Normally, it can be considered that if a dam in this zone is stable under static loading conditions, it can be assumed safe for any expected earthquake loading. The dam appears to be statically stable and it is assumed that this dam is stable for any expected earthquake loadings.

SECTION 7  
ASSESSMENT AND RECOMMENDATIONS/REMEDIAL MEASURES

7.1 Dam Assessment.

a. Safety. The dam appears to be in fair condition. No signs of immediate instability were observed during the inspection. Minor erosion is occurring near the right spillway wingwall on the downstream slope. The potential for erosion exists at the spillway approach adjacent to both wingwalls. Seepage noted during the inspection was observed in several locations. Flow from the right abutment was measured to be approximately 43 to 45 gallons per minute. The origination of the flow could not be determined due to the fact that a spring exists on the right abutment and contributes significantly to the measured flow along the toe. A seepage area was located adjacent to the 24 inch discharge structure located at the toe of the dam. Seepage in this area was noted to be approximately 2 gallons per minute. The visual observations, review of available data, hydraulic and hydrologic calculations indicate that the YMCA dam's spillway is adequate.

b. Adequacy of Information. Sufficient information is available to complete a Phase I Report.

c. Urgency. The recommendations suggested below should be implemented immediately.

d. Necessity for Further Investigation. In order to accomplish some of the recommendations/remedial measures outlined below, further investigations will be required.

7.2 Recommendations/Remedial Measures.

1. The fence which spans the spillway crest should be removed. The purpose of the fence is unclear. Restricting spillway discharges is a safety hazard and some alternate solution should be developed to serve whatever purpose the fence fulfilled.

2. The seepage and wet areas located on the downstream slope and at the toe of the embankment should be monitored for turbidity and quantity at regular intervals and during periods of heavy precipitation. The seepage observed at the right abutment and along the toe of the downstream slope near the right abutment should be channeled into a collection drainage channel. The discharge from the spring located at the right abutment should be diverted away from the toe of the dam in order that

any seepage from the dam along the toe could be observed. The monitoring program and the monitoring readings should be evaluated by a registered professional engineer experienced in dam design and construction. Measures to control seepage should be implemented as required.

3. Provide erosion protection on the downstream slope adjacent to the right spillway wingwall. Erosion protection should be provided on the upstream slope adjacent to the spillway approach wingwalls.

4. Some means of positive upstream closure of the drainline should be developed.

5. Deterioration of the grouted riprap section should be evaluated by a registered professional engineer knowledgeable in dam design and construction and should be repaired as deemed necessary by the investigation.

6. The reservoir drain should be operated and lubricated on a regular basis.

7. A warning system should be developed to warn any downstream residents or property owners of large spillway discharges or imminent failure of the dam. This should be accomplished prior to future development below the dam.

8. A safety program should be implemented with inspections at regular intervals by qualified personnel.

APPENDIX A  
CHECKLIST, VISUAL INSPECTION, PHASE I



CHECK LIST  
VISUAL INSPECTION  
PHASE I

NAME OF DAM YMCA Dam COUNTY Carbon STATE Pennsylvania ID# PA 873  
 TYPE OF DAM Earthfill  
 DATE(s) INSPECTION April 8, 1980 WEATHER Clear and cool HAZARD CATEGORY Significant  
 TEMPERATURE Mid 50's  
 POOL ELEVATION AT TIME OF INSPECTION 1535.0 M.S.L. TAILWATER AT TIME OF INSPECTION None M.S.L.

INSPECTION PERSONNEL:

R. Jeffrey Kimball, P.E. - L. Robert Kimball and Associates  
James T. Hockensmith - L. Robert Kimball and Associates  
O.T. McConnell - L. Robert Kimball and Associates  
Brian Maguire - Pennsylvania Department of Environmental Resources  
Denny Diekey - Pennsylvania Department of Environmental Resources  
James T. Hockensmith RECORDER

# EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	None.	
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	None.	
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	Minor erosion on downstream slope adjacent to spillway wingwall.	
VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST	No observed efficiencies. Low spot on the crest near the left abutment. Top of dam elevation 1539.0 feet.	
RIPRAP FAILURES	No riprap on upstream slope adjacent to the spillway approach wingwalls.	

# EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
VEGETATION	Crest of dam, upstream and downstream slopes grass covered.	
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	Appears to be good with the exception of potential erosion adjacent to spillway wingwalls on upstream slope. Erosion exists on the downstream slope adjacent to the right spillway wingwall.	
ANY NOTICEABLE SEEPAGE	Seepage observed along the downstream toe near the right abutment contact and adjacent to the spillway drainline discharge structure.	
STAFF GAUGE AND RECORDER	None.	
DRAINS	None.	

**CONCRETE/MASONRY DAMS**

<b>VISUAL EXAMINATION OF</b>	<b>OBSERVATIONS</b>	<b>REMARKS OR RECOMMENDATIONS</b>
<b>ANY NOTICEABLE SEEPAGE</b>	Not applicable.	
<b>STRUCTURE TO ABUTMENT/EMBANKMENT JUNCTIONS</b>	Not applicable.	
<b>DRAINS</b>	Not applicable.	
<b>WATER PASSAGES</b>	Not applicable.	
<b>FOUNDATION</b>	Not applicable.	

**CONCRETE/MASONRY DAMS**

<b>VISUAL EXAMINATION OF</b>	<b>OBSERVATIONS</b>	<b>REMARKS OR RECOMMENDATIONS</b>
<b>SURFACE CRACKS CONCRETE SURFACES</b>	Not applicable.	
<b>STRUCTURAL CRACKING</b>	Not applicable.	
<b>VERTICAL AND HORIZONTAL ALIGNMENT</b>	Not applicable.	
<b>MONOLITH JOINTS</b>	Not applicable.	
<b>CONSTRUCTION JOINTS</b>	Not applicable.	
<b>STAFF GAUGE OR RECORDER</b>	Not applicable.	

# OUTLET WORKS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	None observed.	
INTAKE STRUCTURE	Not applicable.	
OUTLET STRUCTURE	24 inch corrugated metal pipe. Discharges directly at the toe of dam. Discharge structure in good condition.	
OUTLET CHANNEL	Discharges to natural stream.	
EMERGENCY GATE	Not operated during inspection - unobserved.	

# UNGATED SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE WEIR	Concrete structure, ogee shaped weir. Appears to be in good condition. A fence which spans the spillway crest should be removed.	
APPROACH CHANNEL	Lake. No obstructions noted during time of inspection.	
DISCHARGE CHANNEL	Trapezoidal shaped, protected by slush grouted riprap for a distance of approximately 60 feet. Open cut channel to the natural stream. Possible undercutting at the end of the slush grouted section.	
BRIDGE AND PIERS	None.	

# GATED SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE SILL	Not applicable.	
APPROACH CHANNEL	Not applicable.	
DISCHARGE CHANNEL	Not applicable.	
BRIDGE AND PIERS	Not applicable.	
GATES AND OPERATION EQUIPMENT	Not applicable.	



# DOWNSTREAM CHANNEL

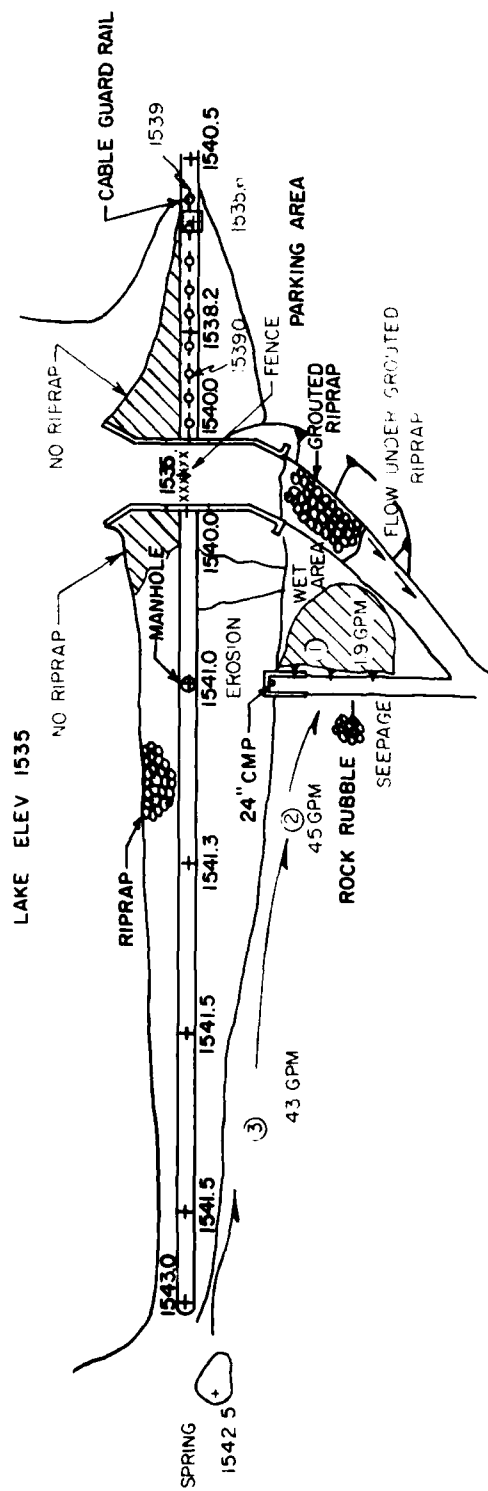
VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	Drakes Creek is a narrow stream for its entire distance of approximately 2 miles until it joins the Lehigh River. No homes were observed to be located along the downstream channel. The potential for development of the downstream area is evident and should be closely monitored for the purpose of updating the hazard classification potential for this dam.	
SLOPES	Appear to be stable.	
APPROXIMATE NO. OF HOMES AND POPULATION	No homes were observed along the downstream channel. Potential development is probable and should be evaluated on a regular basis.	

# RESERVOIR

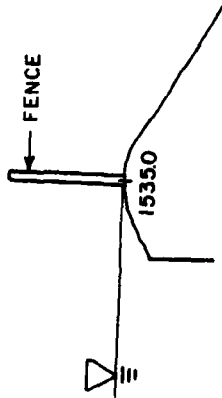
VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	Gentle slopes. Appear to be stable.	
SEDIMENTATION	Unknown.	

# INSTRUMENTATION

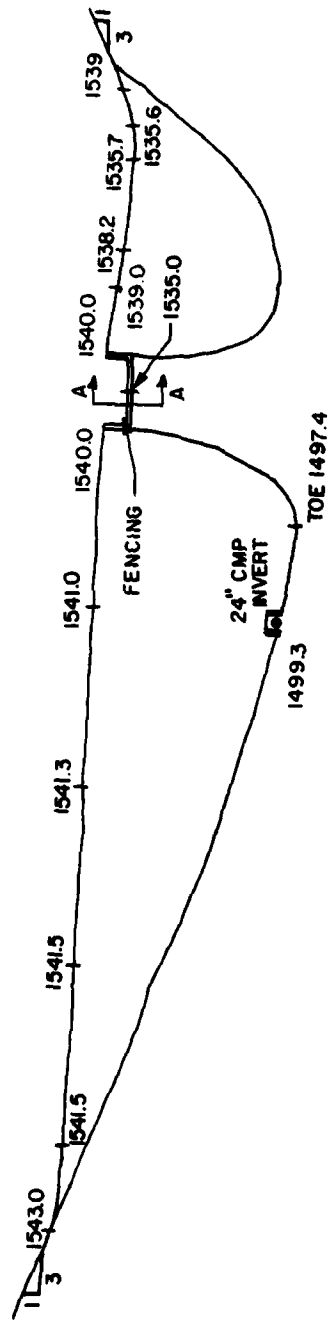
VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
MONUMENTATION/SURVEYS	None.	
OBSERVATION WELLS	None.	
WEIRS	None.	
PIEZOMETERS	None.	
OTHER	None.	



YMCA DAM  
(Scale 1" = 100')



**SPILLWAY CREST  
SECTION A-A**  
(Not To Scale)



**PROFILE  
LOOKING UPSTREAM**  
Scale: Horiz. 1" = 100'  
Vert. 1" = 40'



**YMCA DAM**

APPENDIX B  
CHECKLIST, ENGINEERING DATA, DESIGN, CONSTRUCTION, OPERATION,  
PHASE I

CHECK LIST  
ENGINEERING DATA  
DESIGN, CONSTRUCTION, OPERATION  
PHASE I

NAME OF DAM YMCA Dam  
ID# PA 873

ITEM	REMARKS
AS-BUILT DRAWINGS	None.
REGIONAL VICINITY MAP	U.S.G.S. quadrangle.
CONSTRUCTION HISTORY	Minimal information in DER files.
TYPICAL SECTIONS OF DAM	None available for review.
OUTLETS - PLAN - DETAILS - CONSTRAINTS - DISCHARGE RATINGS RAINFALL/RESERVOIR RECORDS	None. None. None. None. None.

ITEM	REMARKS
DESIGN REPORTS	None.
GEOLOGY REPORTS	None.
DESIGN COMPUTATIONS HYDROLOGY & HYDRAULICS DAM STABILITY SEEPAGE STUDIES	None.
MATERIALS INVESTIGATIONS BORING RECORDS LABORATORY FIELD	DER files suggest that borings were completed prior to construction. Boring information not available for review. Field density test and concrete compression test results in DER files.
POST-CONSTRUCTION SURVEYS OF DAM	Unknown.
BORROW SOURCES	Unknown



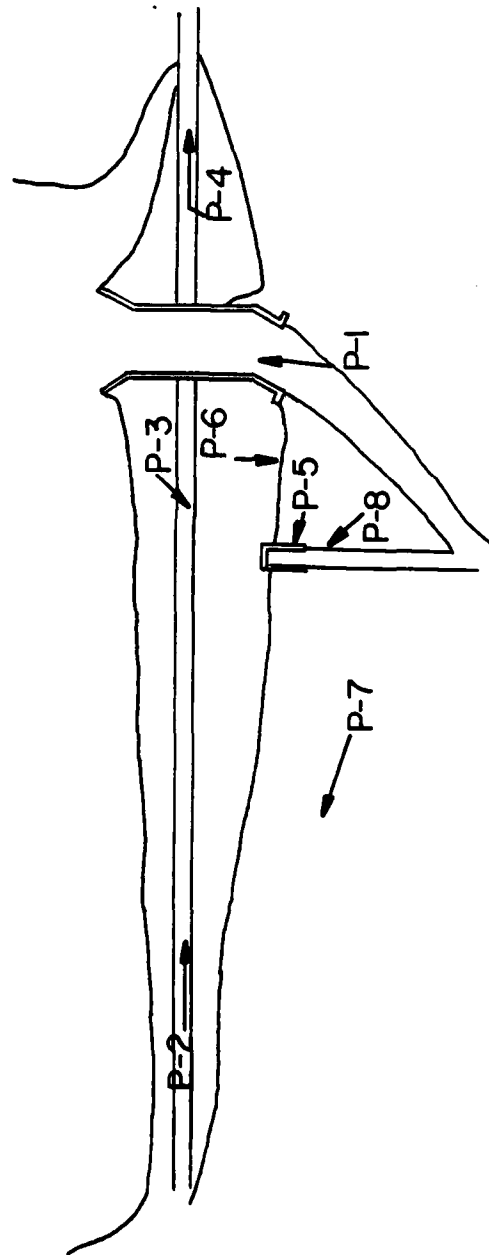
ITEM	REMARKS
MONITORING SYSTEMS	None.
MODIFICATIONS	Unknown.
HIGH POOL RECORDS	Unknown.
POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS	Unknown.
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS	Unknown.
MAINTENANCE OPERATION RECORDS	Unknown.

ITEM	REMARKS
SPILLWAY PLAN  SECTIONS  DETAILS	None available for review.
OPERATING EQUIPMENT PLANS & DETAILS	None available for review.

APPENDIX C  
PHOTOGRAPHS



YMCA DAM  
PHOTO INDEX



P- INDICATES PHOTO LOCATION

C-1

## YMCA DAM

### Photograph Descriptions

#### Sheet 1. Front

- (1) Upper left - Spillway discharge structure with slush grouted riprap discharge channel in foreground.
- (2) Upper right - View of upstream slope, crest of dam and left abutment.
- (3) Lower left - Manhole cover for 24" gate valve.
- (4) Lower right - View of upstream slope and area providing additional spillway capacity at the left abutment.

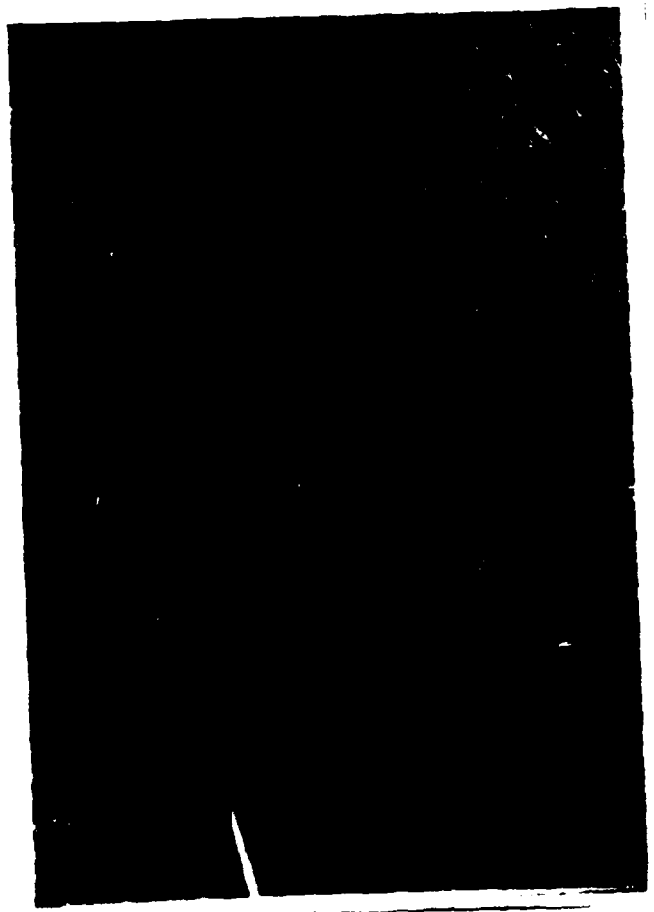
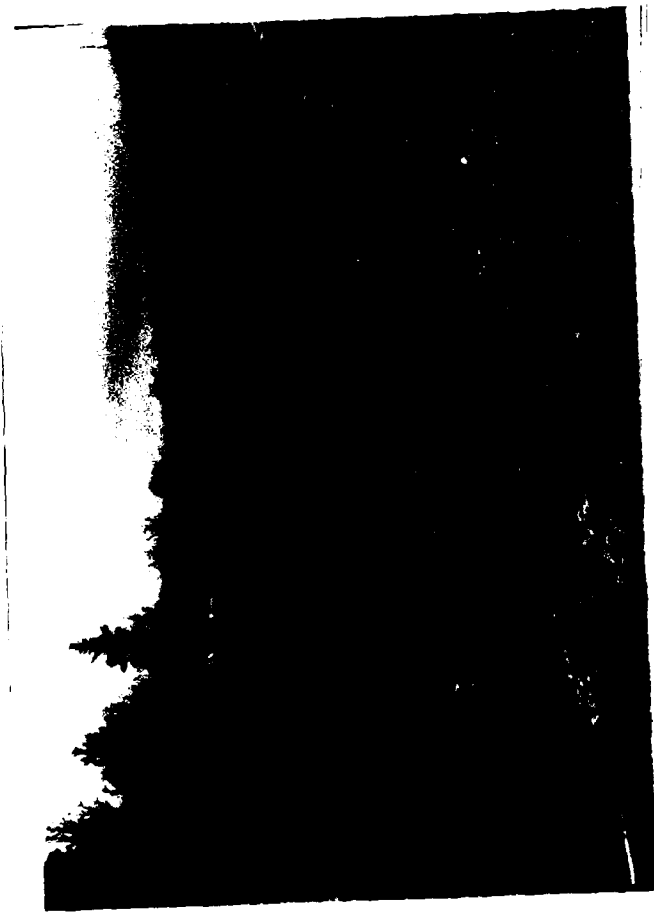
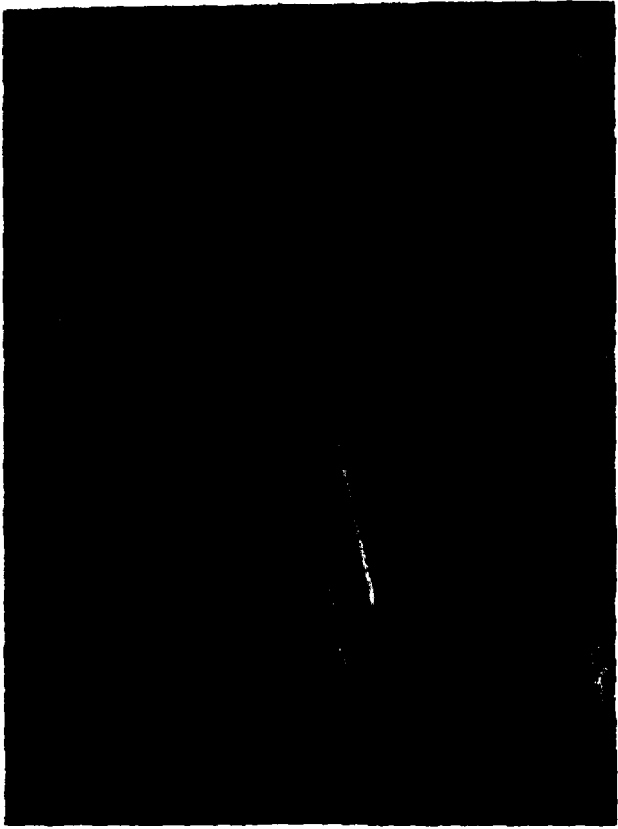
#### Sheet 1. Back

- (5) Upper left - Downstream slope, 24" CMP discharge structure and seepage area in foreground.
- (6) Upper right - Downstream view of discharge channel.
- (7) Lower left - Downstream slope and right abutment.
- (8) Lower right - Seepage area at toe adjacent to 24" CMP discharge structure.

TOP OF PAGE

1	2
3	4





APPENDIX D  
HYDROLOGY AND HYDRAULICS



APPENDIX D  
HYDROLOGY AND HYDRAULICS

Methodology. The dam overtopping and breach analyses were accomplished using the systemized computer program HEC-1 (Dam Safety Investigation), September, 1978, prepared by the Hydrologic Engineering Center, U.S. Army Corps of Engineers, Davis, California. A brief description of the methodology used in the analysis is presented below.

1. Precipitation. The Probable Maximum Precipitation (PMP) is derived and determined from regional charts prepared from past rainfall records including "Hydrometeorological Report No. 40" prepared by the U.S. Weather Bureau.

The index rainfall is reduced from 10% to 20% depending on watershed size by utilization of what is termed the HOP Brook adjustment factor. Distribution of the total rainfall is made by the computer program using distribution methods developed by the Corps.

2. Inflow Hydrograph. The hydrologic analysis used in development of the overtopping potential is based on applying a hypothetical storm to a unit hydrograph to obtain the inflow hydrograph for reservoir routing.

The unit hydrograph is developed using the Snyder method. This method requires calculation of several key parameters. The following list gives these parameters their definition and how they were obtained for these analysis.

Parameter	Definition	Where Obtained
Ct	Coefficient representing variations of watershed	From Corps of Engineers*
L	Length of main stream channel miles	From U.S.G.S. 7.5 minute topographic
Lca	Length on main stream to centroid of watershed	From U.S.G.S. 7.5 minute topographic
Cp	Peaking coefficient	From Corps of Engineers*
A	Watershed size	From U.S.G.S. 7.5 minute topographic

\*Developed by the Corps of Engineers on a regional basis for Pennsylvania.

3. Routing. Reservoir routing is accomplished by using Modified Plus routing techniques where the flood hydrograph is routed through reservoir storage. Hydraulic capacities of the outlet works, spillways and the crest of the dam are used as outlet controls in the routing.

The hydraulic capacity of the outlet works can either be calculated and input or sufficient dimensions input and the program will calculate an elevation discharge relationship.

Storage in the pool area is defined by an area - elevation relationship from which the computer calculates storage. Surface areas are either planimeted from available mapping or U.S.G.S. 7.5 minute series topographic maps or taken from reasonably accurate design data.

4. Dam Overtopping. Using given percentages of the PMF the computer program will calculate the percentage of the PMF which can be controlled by the reservoir and spillway without the dam overtopping.

5. Dam Breach and Downstream Routing. The computer program is equipped to determine the increase in downstream flooding due to failure of the dam caused by overtopping. This is accomplished by routing both the pre-failure peak flow and the peak flow through the breach (calculated by the computer with given input assumptions) at a given point in time and determining the water depth in the downstream channel. Channel cross-sections taken from U.S.G.S. 7.5 minute topographic maps were used in the downstream flood wave routing. Pre and post failure water depths are calculated at locations where cross-sections are input.

# HYDROLOGY AND HYDRAULICS ANALYSIS DATA BASE

NAME OF DAM: YMCA Dam

PROBABLE MAXIMUM PRECIPITATION (PMP) = 22.0

STATION	1	2	3
---------	---	---	---

Station Description	YMCA Dam
---------------------	----------

Drainage Area (square miles)	1.49
---------------------------------	------

Cumulative Drainage Area (square miles)	1.49
--	------

Adjustment of PMF for Drainage Area (%) <sup>(1)</sup>	
6 hours	111
12 hours	123
24 hours	133
48 hours	142
72 hours	

Snyder Hydrograph	
Parameters	
Zone <sup>(2)</sup>	2
C <sub>p</sub> <sup>(3)</sup>	0.45
C <sub>t</sub> <sup>(3)</sup>	2.10
L (miles) <sup>(4)</sup>	1.70
L <sub>ca</sub> (miles) <sup>(4)</sup>	0.89
t <sub>p</sub> = C <sub>t</sub> (L <sub>x</sub> L <sub>ca</sub> ) 0.3 hrs.	2.38

Spillway Data	
Crest Length (ft)	42
Freeboard (ft)	4.0
Discharge Coefficient	3.2
Exponent	1.5

- (1) Hydrometeorological Report 33 (Figure 1), U.S. Army Corps of Engineers, 1965.
- (2) Hydrological zone defined by Corps of Engineers, Baltimore District, for determining Snyder's coefficients (C<sub>p</sub> and C<sub>t</sub>).
- (3) Snyder's Coefficients.
- (4) L=Length of longest water course from outlet to basin divide.  
L<sub>ca</sub>=Length of water course from outlet to point opposite the centroid of drainage area.

CHECK LIST  
HYDROLOGIC AND HYDRAULIC  
ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: 1.49 mi<sup>2</sup> wooded gentle slopes

ELEVATION TOP NORMAL POOL (STORAGE CAPACITY): 215 ac-ft

ELEVATION TOP FLOOD CONTROL POOL (STORAGE CAPACITY): 280 ac-ft

ELEVATION MAXIMUM DESIGN POOL: Unknown

ELEVATION TOP DAM: 1539.0

SPILLWAY CREST:

- a. Elevation 1535.0
- b. Type Concrete ogee section
- c. Width Crest length - 42 feet
- d. Length Slush grouted riprap for approximately 60'
- e. Location Spillover Near left abutment
- f. Number and Type of Gates None

OUTLET WORKS:

- a. Type 24" CMP
- b. Location Through embankment - approximately Station 2+10
- c. Entrance inverts Unknown
- d. Exit inverts 1499.3
- e. Emergency drawdown facilities 24" CMP

HYDROMETEOROLOGICAL GAUGES:

- a. Type None
- b. Location None
- c. Records None

MAXIMUM NON-DAMAGING DISCHARGE: Unknown



L. ROBERT KIMBALL & ASSOCIATES  
CONSULTING ENGINEERS & ARCHITECTS  
EBENSBURG PENNSYLVANIA

DAM NAME YMCA

I.D. NUMBER 873

SHEET NO. 1 OF 4

BY CAB DATE 5-6-80

### LOSS RATE AND BASE FLOW PARAMETERS

RECOMMENDED BY CORPS OF ENGINEERS  
BALTIMORE DISTRICT

STATL = 1 INCH

CNSTL = .05 IN/HR

STRTRQ = 1.5 CFS / MI<sup>2</sup>

QRCSN = .05 (5% OF PEAK FLOW)

RTIOR = 2.0

### ELEVATION - AREA - CAPACITY - RELATIONSHIPS

FROM U.S.G.S. 7.5 MIN QUAD., AND FIELD  
INSPECTION DATA.

SCALE 1" = 2000'

ELEV.	AREA SQ. IN.	AREA (AC)	AVG. AREA (AC)	ΔH (FT)	Δ STORAGE (AC. FT)	TOTAL STORAGE (AC. FT)
1500	.003	.28	2.02	20	40.4	
1520	.041	3.76	16.12	20	322.3	40.4
1540	.31	28.47	55.10	20	1102	362.7
1560	.89	81.73				1464.7



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EBENSBURG PENNSYLVANIA

DAM NAME YMCA DAM

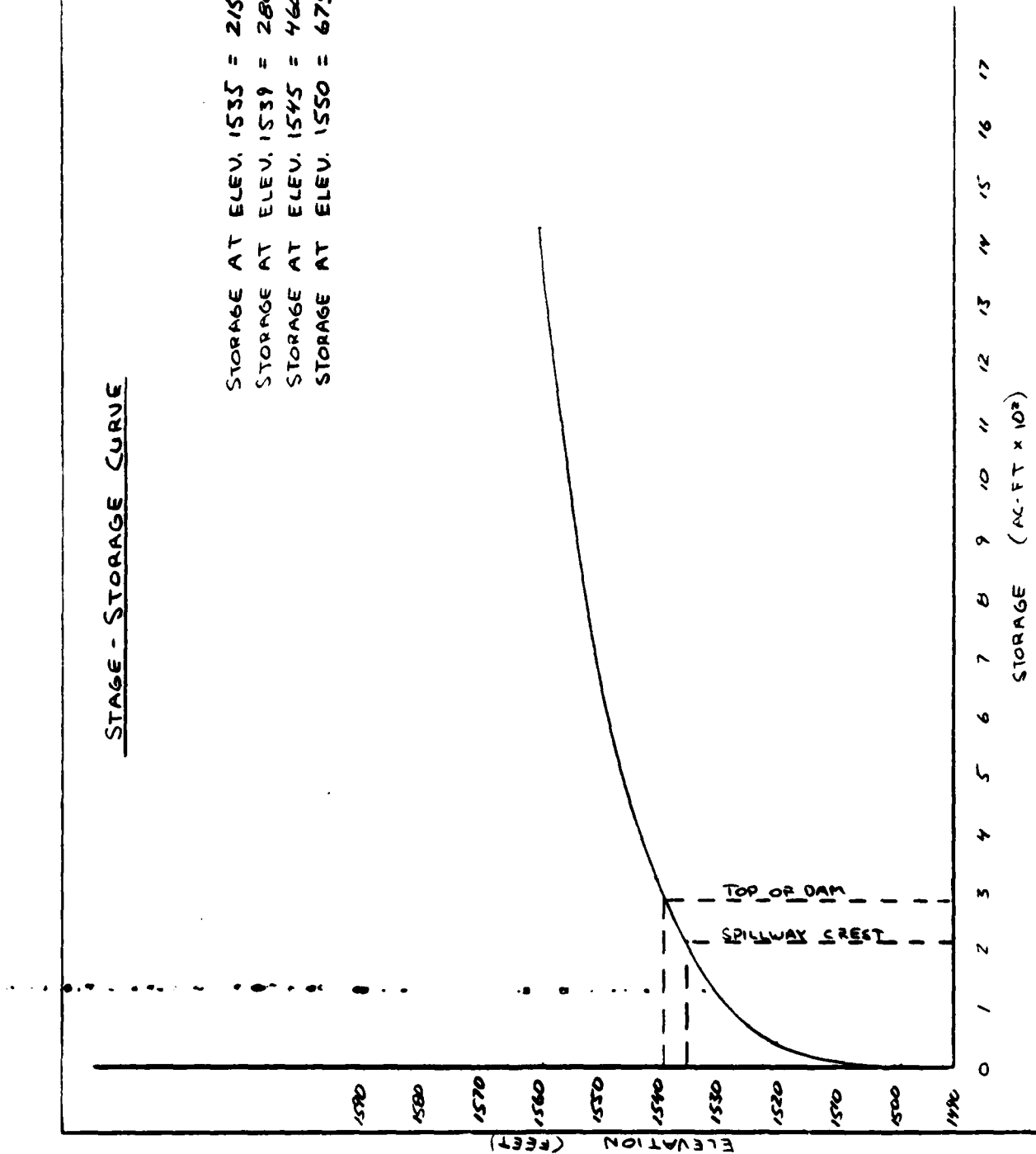
I.D. NUMBER 873

SHEET NO. 2 OF 4

BY CAB DATE 5-6-60

STAGE - STORAGE CURVE

STORAGE AT ELEV. 1535 = 215 AC.-FT  
STORAGE AT ELEV. 1539 = 280 AC.-FT  
STORAGE AT ELEV. 1545 = 460 AC.-FT  
STORAGE AT ELEV. 1550 = 675 AC.-FT





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CONSULTING ENGINEERS & ARCHITECTS  
EBENSBURG PENNSYLVANIA

DAM NAME YMCA DAM

I.D. NUMBER B73

SHEET NO. 3 OF 4

BY CAB DATE 5-6-80

SPILLWAY CREST ELEV. = 1535  
POND SURFACE AREA = 1940 AC  
INITIAL STORAGE = 215 AC-FT

\$S	0	28	40	215	280	360
\$E	1498	1500	1520	1535	1539	1540

460	675
1545	1550

### OVERTOPPING PARAMETERS

\* TOP OF DAM ELEV. = 1539  
LENGTH OF DAM (EXCLUDING SPILLWAY) = 608'  
COEFFICIENT OF DISCHARGE = 3.0

\$L	20	50	80	120	155	303
\$V	1535.7	1537	1538	1539	1540	1541

588	628	663	738
1542	1543	1544	1545

\* ADDITIONAL SPILLWAY CAPACITY IS PROVIDED BY A LOW SPOT ON THE LEFT ABUTMENT. THIS ADDITIONAL CAPACITY WILL BE ACCOUNTED FOR IN THE \$L, \$V OPTIONS. OVERTOPPING WILL NOT BE CONSIDERED UNTIL ELEV. 1539.



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CONSULTING ENGINEERS & ARCHITECTS  
EBENSBURG PENNSYLVANIA

DAM NAME YMCA DAM

I.D. NUMBER 873

SHEET NO. 4 OF 4

BY CAB DATE 5-6-80

### SPILLWAY RATING CURVE

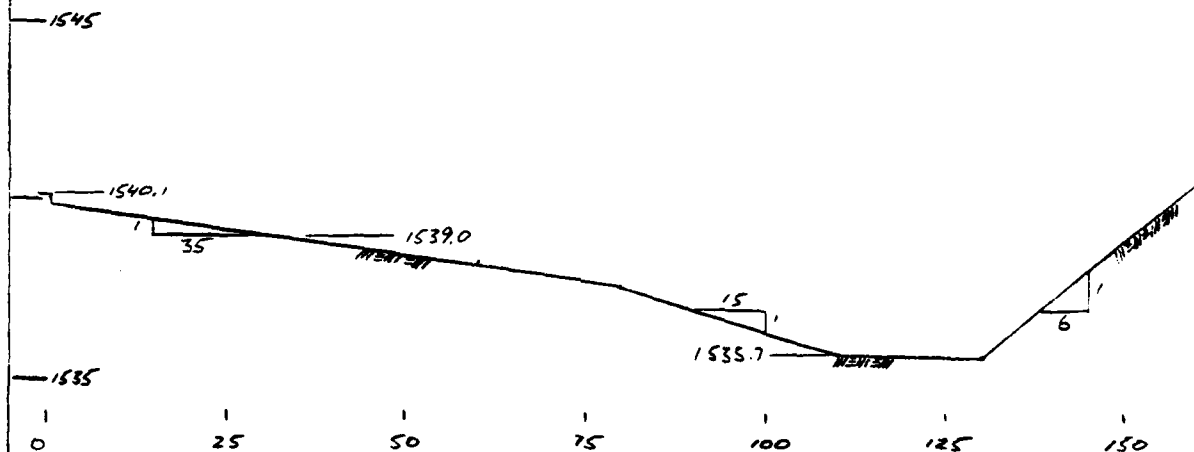
DETERMINED BY HEC-1 COMPUTER PROGRAM

CREST ELEV. = 1535

LENGTH OF SPILLWAY = 42'

COEFFICIENT OF DISCHARGE = 3.2

### PROFILE OF ADDITIONAL SPILLWAY CAPACITY





\*\*\*\*\*  
 FLOOD HYDROGRAPH PACKAGE (HEC-1)  
 DAM SAFETY VERSION JULY 1978  
 LAST MODIFICATION 26 FEB 79  
 \*\*\*\*\*

ANALYSIS OF DAM OVERTOPPING USING RATIOS OF PMF														
HYDROLOGIC-HYDRAULIC ANALYSIS OF SAFETY OF THE YMCA DAM														
RATIOS OF PMF ROUTED THROUGH THE RESERVOIR (873)														
1	A1	0	0	0	0	0	0	0	0	0	0	0	0	0
2	A2	0	0	0	0	0	0	0	0	0	0	0	0	0
3	A3	0	0	0	0	0	0	0	0	0	0	0	0	0
4	B	288	0	10	0	0	0	0	0	0	0	0	0	0
5	B1	5	1	5	1	1	1	1	1	1	1	1	1	1
6	J	1	1	1	1	1	1	1	1	1	1	1	1	1
7	J1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	1.1	1.2	1.3	1.4
8	K	0	1	1	1	1	1	1	1	1	1	1	1	1
9	K1	0	1	1	1	1	1	1	1	1	1	1	1	1
10	M	1	1	1	1	1	1	1	1	1	1	1	1	1
11	P	22.0	111	123	133	142	142	142	142	142	142	142	142	142
12	T	1	1	1	1	1	1	1	1	1	1	1	1	1
13	W	2.38	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45
14	X	-1.05	-0.05	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
15	K	1	2	2	2	2	2	2	2	2	2	2	2	2
16	K1	1	1	1	1	1	1	1	1	1	1	1	1	1
17	Y	1	1	1	1	1	1	1	1	1	1	1	1	1
18	V1	1	1	1	1	1	1	1	1	1	1	1	1	1
19	S	0	0.28	40	215	280	360	460	675	675	675	675	675	675
20	SE	1498	1900	1520	1535	1539	1540	1545	1550	1550	1550	1550	1550	1550
21	SE	1539	42	3.2	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
22	SO	1539	3.0	1.5	608	608	608	608	608	608	608	608	608	608
23	SL	20	50	80	120	155	303	588	628	663	738	738	738	738
24	SV1535.7	1537	1538	1539	1540	1541	1542	1543	1544	1545	1545	1545	1545	1545
25	K	99	99	99	99	99	99	99	99	99	99	99	99	99

\*\*\*\*\*  
 FLOOD HYDROGRAPH PACKAGE (HEC-1)  
 DAM SAFETY VERSION JULY 1978  
 LAST MODIFICATION 26 FEB 79  
 \*\*\*\*\*

RUN DATE# 80/05/08.  
 TIME# 05.09.21.

ANALYSIS OF DAM OVERTOPPING USING RATIOS OF PMF  
 HYDROLOGIC-HYDRAULIC ANALYSIS OF SAFETY OF THE YMCA DAM  
 RATIOS OF PMF ROUTED THROUGH THE RESERVOIR (873)

JOB SPECIFICATION									
NO	NHR	NMIN	IDAY	IHR	IMIN	MEIRC	IPLT	IPRT	INSTAN
288	0	10	0	0	0	0	0	0	0
			JOPER	NWT	LROPT	TRACE			
			5	0	0	0			

MULTI-PLAN ANALYSES TO BE PERFORMED

RT/06# 0.20 0.30 0.40 0.50 1.00  
 MPLAN# 1 NRITTO# 5 LRITTO# 1

SUB-AREA RUNOFF COMPUTATION

INFLOW TO RESERVOIR

ISTAO	ICOMP	IECON	ITAPE	JPLT	JPRI	INAME	ISTAGE	IAUTO
1	0	0	0	0	0	1	0	0

HYDROGRAPH DATA

INVDG	ITONG	IAREA	SNAP	TRSDA	TRSPC	RATIO	TSNOW	TSARE	LOCAL
1	1	1.49	0.00	1.49	0.00	0.000	0	0	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.00	22.00	111.00	123.00	133.00	142.00	0.00	0.00

TRSPC COMPUTED BY THE PROGRAM IS .800

LOSS DATA

LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRRS	RTIOTK	STRTL	CNSTL	ALSMR	RTIMP
0	0.00	0.00	1.00	0.00	0.00	1.00	1.00	.05	0.00	0.00

UNIT HYDROGRAPH DATA

TP= 2.38 CP= .45 MIA= 0

RECESSION DATA

SIRIO= -1.50 URCSN= -.05 RTIOR= 2.00  
 FROM GIVEN SNYDER CP AND TP ARE TC=18.89 AND R=22.47 INTERVALS

UNIT HYDROGRAPH END-OF-PLUDED ORDINATES, LAG= 2.60 HOURS, CP= .45 VOL= .98

3.	12.	24.	39.	56.	74.	94.	114.	133.	150.
164.	175.	183.	187.	187.	182.	174.	166.	159.	152.

# HYDROGRAPH ROUTING

## ROUTE THROUGH RESERVOIR

	ISTAG	TCOMP	TECON	ITAPE	JPLT	JPRI	INAME	ISTAGE	AUTO
	2	1	0	0	0	0	I	0	0
CROSS	CROSS	AVG	RROUTING DATA						
0.0	0.000	0.00	TRES	ISAME	IPRI	TPMP		LSTR	
			1	1	0	0			0

CAPACITY	MSIPS	INSTOL	LAG	AMSK	X	TSK	STORA	TSPRAT
0%	0%	40	0	0.000	0.000	0.000	1535	0
			213	280		360	460	675

DAM DATA			
TOPEL	COUD	EXPD	DAMWID
1339.0	3.0	1.5	608.

CREST LENGTH AT OR BELOW ELEVATION	20.	30.	80.	120.	155.	303.	588.	628.	663.	738.
1535.7	1937.0	1538.0	1539.0	1540.0	1541.0	1542.0	1543.0	1544.0	1545.0	

44

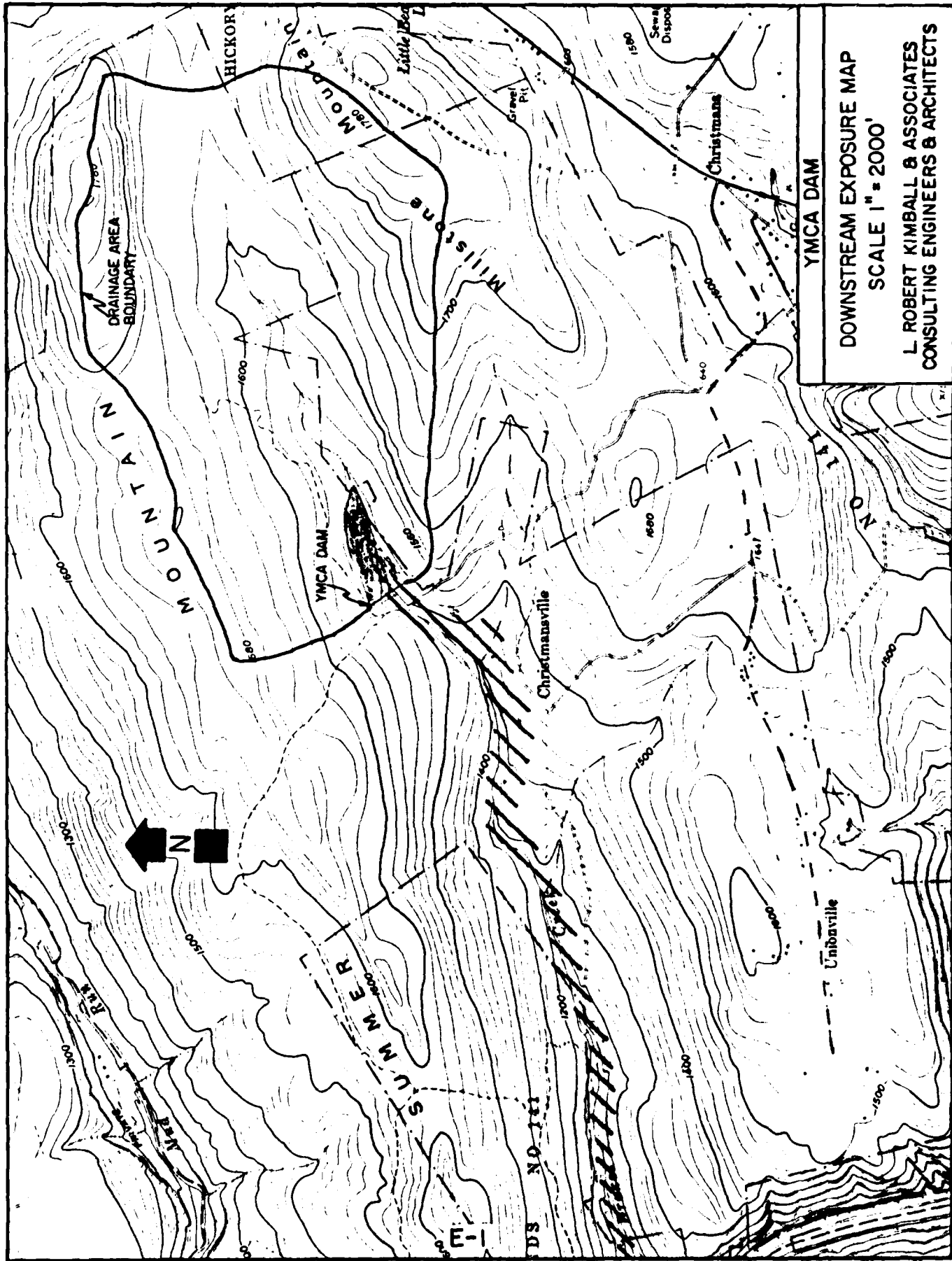
PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS  
 FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)  
 AREA IN SQUARE MILES (SQUARE KILOMETERS)

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO FLOWS				
				RATIO 1	RATIO 2	RATIO 3	RATIO 4	RATIO 5
				.20	.30	.40	.50	1.00
HYDROGRAPH AT	1	1.49	1	537.	805.	1074.	1342.	2684.
		3.861		15.2011	22.8011	30.4011	38.0011	76.0011
ROUTED TO	2	1.49	1	524.	793.	1062.	1329.	2554.
		3.861		14.8511	22.4711	30.0711	37.6311	72.3111

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 .....	RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF FAILURE	
							MAX OUTFLOW HOURS	FAILURE HOURS
	.20	1537.00	0.00	248.	524.	0.00	42.50	0.00
	.30	1537.49	0.00	255.	793.	0.00	42.50	0.00
	.40	1537.89	0.00	262.	1062.	0.00	42.33	0.00
	.50	1538.23	0.00	268.	1329.	0.00	42.33	0.00
	1.00	1539.52	.42	314.	2554.	4.00	42.83	0.00
INITIAL VALUE		1535.00			1535.00			
ELEVATION		215.			215.			
STORAGE		0.			0.			
OUTFLOW					280.			
					2061.			

APPENDIX E  
DRAWINGS



YMCA DAM

DOWNSTREAM EXPOSURE MAP

SCALE 1" = 2000'

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APPENDIX F  
GEOLOGY

### General Geology

The YMCA Dam lies within the Poconos Plateau Section of the Appalachian Plateau Physiographic Province. This region is characterized by both broad and narrow anticlines and synclines. While drag folds and minor faulting may be common in the area, no major faulting is indicated in the vicinity of the dam.

The bedrock underlying the reservoir and dam is the Mississippian aged Pocono Group. This group consists mainly of fine to coarse grained sandstone with some conglomerate, siltstone, shale and coal. The moderate to thick bedding is normally well developed. The regular and steeply dipping to vertical joints are also well developed. The rocks of the Pocono group are very resistant to weathering and form an excellent foundation for heavy structures. The interstitial and secondary porosity give the rocks of this group a high effective porosity.



